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(71) Applicant(s)

**Autoliv Development AB**  
(Incorporated in Sweden)  
Patent Department Sweden, S-447 83 Vargarda,  
Sweden

(72) Inventor(s)

**Stefan Muller**

(74) Agent and/or Address for Service

**Forrester Kettle & Co**  
Forrester House, 52 Bounds Green Road, LONDON,  
N11 2EY, United Kingdom

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B60R 21/16

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(56) Documents Cited

GB 2327066 A

GB 2324068 A

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WPI, EPODOC, JAPIO, INTERNET

OCB  
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(54) Abstract Title

Side air-bag arrangement

(57) An air-bag (1) for use in a motor vehicle forms an inflatable curtain located adjacent the side of the vehicle extending from the "A"-Post (2) past the "B"-Post (3) to the "C"-Post (4) on inflation. A recess (13) is provided in the lower edge of the inflatable element. Respective corners (16, 17) are defined between the sides (14, 15) of the recess (13) and the lower edge (12) of the inflatable element. The inflatable element defines two elongate chambers (20, 21) which are adapted to be inflated on inflation of the inflatable element. Each chamber (20, 21) extends up to and terminates at a point adjacent a respective corner (16, 17). Preferably the axis of each chamber substantially intersects the angle at the corner (16, 17).

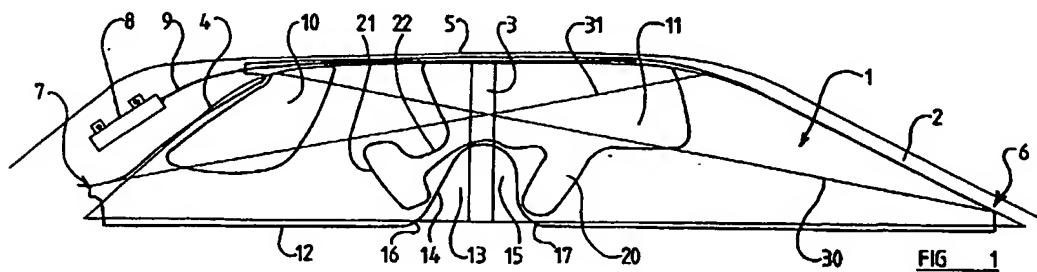


FIG 1

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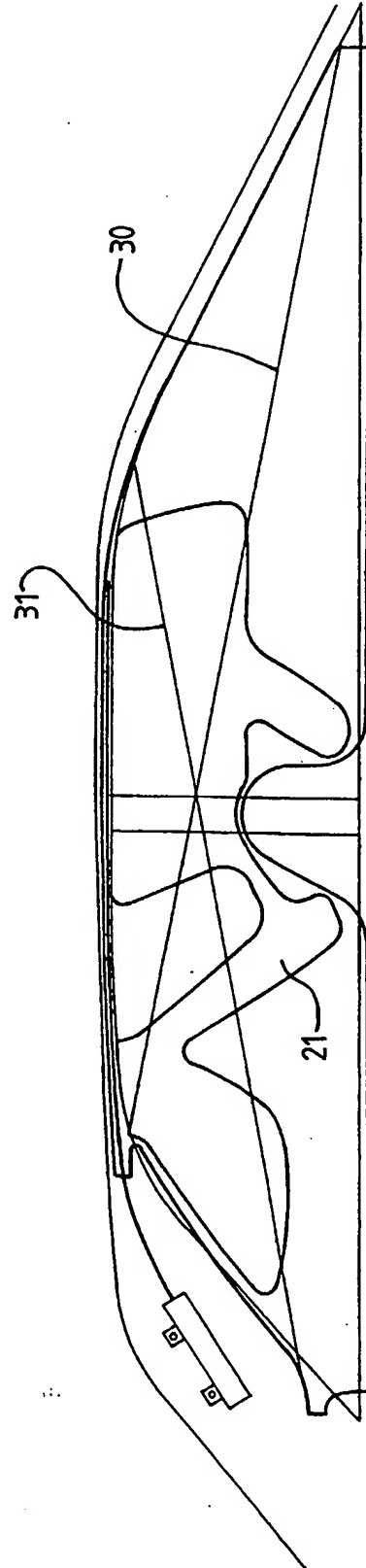
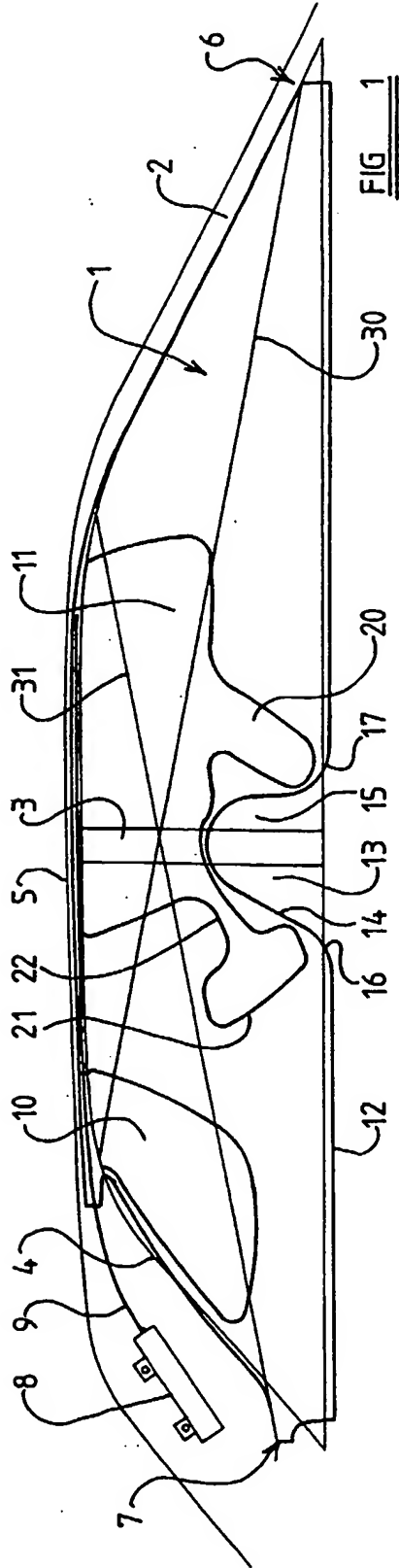


FIG 2

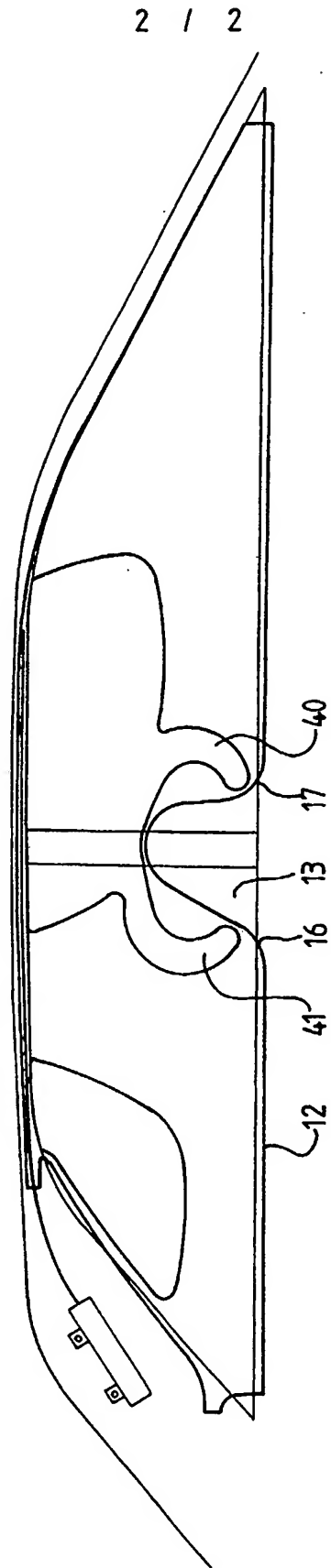


FIG 3

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## DESCRIPTION OF INVENTION

### **"IMPROVEMENTS IN OR RELATING TO AN AIR-BAG ARRANGEMENT"**

**THE PRESENT INVENTION** relates to an air-bag arrangement, and more particularly relates to an air-bag arrangement adapted to provide protection for an occupant of a vehicle in the event that a side impact or roll-over situation should occur.

It has been proposed to provide various types of air-bag or inflatable element initially located in the roof-line of the motor vehicle and adapted, when inflated, to constitute an inflated curtain located adjacent the doors and side windows of the motor vehicle. The inflatable elements of this type are disclosed in GB-A-2,229,750 A.

Some of the inflatable elements disclosed in this prior proposed British Specification extend over both the front door and rear door of the motor vehicle, with the inflatable element thus extending past the "B"-Post. As disclosed in the prior British Specification, it is desirable to be able to tension the lower edge of the inflatable element when it inflates, so as to provide an optimum degree of protection for an occupant of the vehicle. This does, unfortunately, lead to some conflict between the inflatable element and the part

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of the safety-belt that passes through the pillar-loop, unless the inflatable element only covers the upper part of the windows, and does not extend down far enough to engage with the safety-belt.

The present invention seeks to provide an improved air-bag arrangement.

According to this invention there is provided an air-bag arrangement for use in a motor vehicle in the form of an inflatable element adapted to form an inflatable curtain located adjacent a side of the vehicle on inflation thereof, the inflatable element having a lower edge extending between two anchoring points provided on the "A"-Post and "C"-Post of a vehicle, part of the lower edge of the inflatable element forming a recess in alignment with the "B"-Post, respective corners being defined by two opposed edges of the recess and the parts of the lower edge of the inflatable element to either side of the recess, the inflatable element defining two elongate chambers adapted to be inflated on inflation of the inflatable element, each said chamber extending to and terminating at a point adjacent a respective corner between one side edge of the recess and an adjacent part of the lower edge of the inflatable element.

Preferably each said chamber is substantially linear.

Conveniently the axis of each said chamber substantially intersects the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.

Alternatively the axis of each chamber makes an angle of up to  $30^{\circ}$  with the intersection of the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.

Alternatively each said chamber is of arcuate form.

Preferably the chambers surround and embrace the recess.

Conveniently the terminal part of each said chamber substantially intersects the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.

Alternatively the terminal part of each side chamber makes an angle of up to  $30^{\circ}$  with the intersection of the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.

Preferably the chambers are connected to or form part of a chamber that extends forwardly from the "B"-Post of the vehicle.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is schematically illustrating one embodiment of the invention, when inflated,

FIGURE 2 is a view corresponding to Figure 1 showing a modified embodiment of the invention, and

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FIGURE 3 is a view corresponding to Figure 1 showing a further alternative embodiment of the invention.

Referring now to Figure 1, an inflatable element or air-bag 1 is shown in the inflated form. It is to be noted that the inflatable element or air-bag is mounted within a motor vehicle, the motor vehicle having an "A"-Post 2, a "B"-Post 3 and a "C"-Post 4, the vehicle also including a roof 5. The inflatable element or air-bag 1 is initially stored in a recess or housing that extends from a point 6 adjacent the lower part of the "A"-Post 2, along the "A"-Post, along the line of the roof 5 across the top of the "B"-Post, and at least part-way down the "C"-Post to a further fixed point 7. The inflatable element or air-bag 1 is anchored to the vehicle at or adjacent the points 6 and 7, and also at various points along the roof-line of the vehicle. The inflatable element or air-bag 1 extends down to a level just below the lower edges of the windows. Thus, effectively, the windows are totally covered by the inflatable element.

A gas generator 8 is provided which is connected, by means of a duct 9, to inflate the inflatable element 1 in the event that a side impact or roll-over situation should occur.

The inflatable element is formed from two adjacent layers of fabric that are interconnected in selected areas to define a plurality of separate inflatable regions which, when inflated, constitute chambers 10 and 11. The layers of fabric may be "one-piece-woven", and where the layers are interconnected they may merge to form a single layer. The chamber 10 is located in the part of the inflatable element which is towards the rear of the vehicle, and is intended to provide protection for the head of the rear seat occupant. The chamber 11 is located more towards the front of the vehicle and overlaps the "B"-Post 3, and

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is adapted primarily to provide protection for the head of the occupant of the front seat of the vehicle.

The chamber 11, and further extensions thereof, will be described in more detail below.

It is to be understood that further inflatable regions or chambers may be provided which have been omitted from the present drawings for the sake of clarity of illustration.

The lower edge of the inflatable element or air-bag 1, that is to say edge 12, extends substantially between the points 6 and 7, and is located below the lower edges of the windows. The lower edge of the inflatable element or air-bag 1 should, ideally, become tensioned as the inflatable element inflates. However, a central part of the lower edge is cut-away to form a recess 13 which is aligned with the "B"-Post 3. The recess 13 is provided so that a safety-belt connected to a pillar-loop adjuster mounted on the "B"-Post 3 and worn by the occupant of the front seat of the vehicle, will not be impacted by the inflatable element or air-bag 1 as it inflates. However, the provision of this recess 13 gives rise to a problem in creating tension across the lower edge of the inflatable element.

It can be seen that the recess 13 has two opposed side edges 14, 15, and there is a first corner formed by the inflatable element in the form of a corner 16 which is located between edge 14 of the recess and the left-hand part of the lower edge 12 of the inflatable element, and similarly there is a second corner 17 which is located between the second edge 15 of the recess and the right-hand part of the lower edge 12 of the inflatable element or air-bag 1.



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As can be seen in Figure 1, the chamber 11 is provided with a first extension 20. The extension 20 is in the form of a chamber of elongate form which terminates adjacent the corner 17 and which extends away from the corner 17. In this embodiment, the chamber 20 is straight and defines a straight linear axis which extends away from the corner 17 substantially intersecting the angle formed, at the corner 17, between the side 15 of the recess 13 and the right-hand part of the lower edge 12 of the inflatable element or air-bag 1. In alternative embodiments the axis of the chamber may make an angle of up to  $30^{\circ}$  with the intersection of the angle formed at the corner 17 between the side 15 of the recess 13 and the right-hand part of the lower edge 12 of the inflatable element or air-bag.

A further extension 21 of the chamber 11 is provided, which is of elongate form, having a greater length than width, which is connected to the rest of the chamber 11 by a relatively small connecting passage 22. The chamber 21, in this embodiment, again defines a straight linear axis, with that axis again substantially intersecting the angle defined at the corner 16 by the side edge 14 of the recess 13, and the left-hand part of the lower edge 12 of the inflatable element. As mentioned above, in an alternative embodiment the axis of the chamber may make an angle of up to  $30^{\circ}$  with the intersection of the angle at the corner 16.

When the inflatable element shown in Figure 1 is inflated, a first line of tension 30 is created which extends from the anchoring point 6 provided on the "A"-Post to a second anchoring point provided towards the rear of the roof 5 of the vehicle. This line of tension is created as a consequence of the distension of the parts of the chambers 10 and 11 which are intersected by the tension line 30. These chambers will distend, on inflation, thus bulging out of the plane of the inflatable element, or inflatable curtain, leading to a degree of

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tension being present. Similarly, a second line of tension 31 is created extending from the anchor point 7 provided on the "C"-Post to an anchoring point provided towards the front of the roof-line 5 of the vehicle. This line of tension is again created as a consequence of the inflation and distension of the chambers 10 and 11. These lines of tension will help ensure that the main part of the inflatable element is maintained in a rigid condition. The function of the chambers 20 and 21 described above, is to extend the rigidity constituted by the lines of tension 30, 31 to the regions of the corners 16 and 17. Thus, each chamber 20, 21, as it distends, will come a substantially rigid cylindrical chamber, and, as can be appreciated from a consideration of Figure 1, each chamber extends substantially from one of the lines of tension to the respective corner, with each chamber terminating immediately adjacent the respective corner.

Figure 2 shows an embodiment which is very similar to the embodiment of Figure 1, and which will thus not be re-described in detail. It is sufficient, at this stage, to say that in the embodiment of Figure 1, the chamber 21 has been extended until it communicates with the chamber 10. It is believed that this will provide an enhanced effect, since the chamber 21 actually intersects the two lines of tension 30 and 31.

Figure 3 illustrates a modified embodiment of the invention. In this embodiment of the invention the chamber 20 and the chamber 21, and the associated narrow connecting duct 22, are replaced by two slightly curved, narrow, elongate chambers 40 and 41, which each extend directly from the main chamber 11. The chambers 40 and 41 visually resemble the claws of a pair of pincers. The two chambers are elongate, but of arcuate form and each chamber terminates adjacent a respective corner 16, 17, as described above. The chambers thus surround and embrace the recess. Again, the terminal part

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of each chamber substantially intersects the angle formed, at each corner, between the respective side of the recess 13, and the lower edge 12 of the inflatable element, or makes an angle of up to  $30^{\circ}$  with the intersection of the corner.

It is believed that an air-bag, having chambers of the type described above located on either side of a recess formed in the lower of the inflatable element will have a very acceptable inflation characteristic, with the lower edge of the inflatable element being tensioned, in spite of the fact that a cut-out is provided in the lower edge of the inflatable element.

In the present specification "comprise" means "includes or consists of" and "comprising" means "including or consisting of".

The features disclosed in the foregoing description, or the following Claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

**CLAIMS:**

1. An air-bag arrangement for use in a motor vehicle in the form of an inflatable element adapted to form an inflatable curtain located adjacent a side of the vehicle on inflation thereof, the inflatable element having a lower edge extending between two anchoring points provided on the "A"-Post and "C"-Post of a vehicle, part of the lower edge of the inflatable element forming a recess in alignment with the "B"-Post, respective corners being defined by two opposed edges of the recess and the parts of the lower edge of the inflatable element to either side of the recess, the inflatable element defining two elongate chambers adapted to be inflated on inflation of the inflatable element, each said chamber extending to and terminating at a point adjacent a respective corner between one side edge of the recess and an adjacent part of the lower edge of the inflatable element.
2. An arrangement according to Claim 1 wherein each said chamber is substantially linear.
3. An arrangement according to Claim 2 wherein the axis of each said chamber substantially intersects the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.
4. An arrangement according to Claim 2 wherein the axis of each said chamber makes an angle of up to  $30^{\circ}$  with the intersection of the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.

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5. An arrangement according to Claim 1 wherein each said chamber is of arcuate form.
6. An arrangement according to Claim 5 wherein the chambers surround and embrace the recess.
7. An arrangement according to Claim 5 or 6 wherein the terminal part of each said chamber substantially intersects the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.
8. An arrangement according to Claim 5 or 6 wherein the terminal part of each said chamber makes an angle of up to  $30^{\circ}$  with the intersection of the angle defined at the corner between the respective side edge of the recess and the adjacent part of the lower edge of the inflatable element.
9. An arrangement according to any one of the preceding Claims where the chambers are connected to or form part of a chamber that extends forwardly from the "B"-Post of the vehicle.
10. An air-bag arrangement substantially as herein described with reference to and as shown in Figure 1 of the accompanying drawings.
11. An air-bag arrangement substantially as herein described with reference to and as shown in Figure 2 of the accompanying drawings.
12. An air-bag arrangement substantially as herein described with reference to and as shown in Figure 3 of the accompanying drawings.

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13. Any novel feature or combination of features disclosed herein.



**Application No:** GB 0031377.5  
**Claims searched:** 1 to 12

**Examiner:** Guy Robinson  
**Date of search:** 15 March 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B7B BSB, BSBCC, BSBCR

Int Cl (Ed.7): B60R 21/16

Other: WPI, EPODOC, JAPIO, INTERNET

### Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2327066 A (AUTOLIV) page 1 para 3, page 2 para 3, claims & figs	1 to 3 & 9
A	GB 2324068 A (AUTOLIV) note; cells 2 and ribs 9 (proximity at 'B' pillar	-
X	WO 99/42333 A1 (BREED) figs 1a, 2 & 6, page 3 line 3 to page 4 line 20	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.